Using the NEDSS Base System (NBS) for the disease surveillance component of PHIN: A first look at NBS implementation in Oregon

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Abstract

In 2000, Oregon was awarded charter site funding to build an application for communicable disease reporting. Numerous joint application design and modeling sessions were held to document requirements and customize the CDC-developed public health conceptual data model. We initially attempted to port the NBS to Oregon's platform, IBM DB2 and Websphere. Porting proved to be too resource intensive and downright impractical, so we chose to install the NBS in its native Microsoft SQL environment. Using CDC's recommended guidelines we conducted a baseline assessment of the NBS system.

The NBS simplifies use thru using Internet Explorer 6.0 without requiring any additional soft/hardware. It is designed to receive batch electronic laboratory reports (ELR) from state and national laboratories, however, there are challenges standardizing lab data. The reporting user interface (UI) is not easy to use or manipulate without a data dictionary in hand. For reporting, we will need to directly query the NBS Reporting Database (RDB) and run reports using another program (SAS, Excel, SPSS, etc). This requires an additional access/security control.

A centralized application is designed to minimize maintenance resources; however, deployment and installation of upgrades were labor intensive. Initial migration of entity data were difficult and have no batch update functionality. There is a lack of flexibility to easily accommodate new diseases, however. Locally defined fields can gather additional data, though they cannot be accessed through the NBS UI.

Data quality depends most on who is entering the data; but, a well-designed UI can help. Electronically received data and manual entry of data by the originator should improve data quality; however, the UI can be difficult to use in places (laboratory tests). To assess user acceptance, we currently are piloting the NBS to with one local health department and the Active Bacterial Core Surveillance (ABCs) program. Initial deployment includes all reportable cases in one LHD, extended information on the ABC conditions, and two diseases statewide. Therefore we are unable to assess Sensitivity, Positive Predictive Value, or Representativeness.

Though the date/time auto-populates when a lab report or investigation is entered/received electronically, analysis of reporting timeliness requires basic calculations that cannot be done thru the NBS UI.

While we would like to adopt the NBS, we remain cautiously optimistic of it meeting our disease surveillance needs. We expect that the NBS will evolve with more functionality as each upgrade is released, but we're concerned that enhancement requests will not be incorporated as quickly as we'd like. For example, 13 NBS states were recently asked to prioritize their 3 most needed enhancements from a list of over 500 pending requests.

The NBS facilitates our PHIN compliant secure transmission of data to CDC. As we move forward we will continue to integrate our existing ELR, HAN and CD databases with the NBS, customizing features of the NBS we will utilize as we develop a PHIN for Oregon.

Background

In order to facilitate collection and transmission of data from local health departments to the Centers for Disease Control and Prevention (CDC), we decided to implement the application developed by the Computer Science Corporation, Inc.,for CDC.

During the planning phase we conducted a baseline evaluation of the NBS. We identified gaps in our current activities that would result if we adopted the NBS exclusively, as well as gaps in our current surveillance activities.

Methods

Using the CDC's recommendations for evaluating surveillance systems (MMWR, Vol. 50, RR-3, July 27,2001) as a guideline, we documented the system limitations and benefits.

Results

Simplicity

NBS requires only Internet Explorer 6.0 without requiring any additional soft/hardware and can be accessed from any computer that has Internet connectivity.

It was designed to receive batch feeds of electronic laboratory reports (ELR) from state and national laboratories; however, this is limited due to an inability to customize for local coding.

The existing reporting features within the NBS are not as simple to use or manipulate as our existing state master database. To satisfy our regular reporting of surveillance data we will need to directly query the NBS reporting database (RDB) and run reports using another program (SAS, Excel, SPSS, etc). This requires additional access/security control. In addition there is no way to calculate fields without going through the RDB.

Although, in theory, a centralized application requires less maintenance than a distributed application, upgrades and hot fixes have been resource intensive.

Entity migration of providers and organizations required a lot of data scrubbing, and case data migration will require even more time and resources. Additionally, we will require sending data from the NBS to the state master database because it will be used for analysis and visualization of data until the NBS matures.

Flexibility

Though some flexibility is provided via locally defined fields (LDFs), the NBS does not easily accommodate surveillance for additional diseases and/or events outside of the existing Program Area Modules. The LDFs can only be at the bottom of the form and therefore are not useful for building on questions already asked. Furthermore, LDFs cannot be accessed through the user interface (UI), they need to be queried from the RDB.

New disease conditions can be added using system reference tables (SRTs) but utilize a generic case investigation form which does not allow for disease specific exposure fields.

Another limit to flexibility occurs in the relationships between program area, condition and jurisdiction. These relationships cannot be changed once an investigation has been entered.

Data Quality

Direct entry of electronic data removes duplicate or triplicate data entry and handwriting misinterpretation leading to increased data quality. However, more people are entering data and investigations will not be reviewed at the state level before data entry. A risk arises from the need to synchronize multiple databases to support different surveillance needs: visualization and reporting, day-to-day case management, and reporting to CDC.

Acceptability

We are adapting the roll out and use of the NBS to maximize its acceptability to users. A major concern for LHDs is the ability to measure their assurances; presently the NBS does not support many of these including contact management, outbreak reporting, prophylaxis and vaccination of contacts.

Sensitivity

Until statewide data are entered into the NBS, sensitivity cannot be measured.

Positive Predictive Value (PPV)

This cannot be measured at this time because only cases that have had an investigation will be entered into the system.

Representativeness

This cannot be measured without the migration of historical data from our legacy system and statewide adoption of the system. Furthermore, currently there isn't an easy way to access population data for Oregon counties to calculate rates. This limits the ability to identify populations at risk or describe the distribution of any health condition over time.

Timeliness

Data entered by a LHD are immediately available.

Stability

Overall, the NBS is stable and requires only that the Internet be accessible, however, installation and integration into our authentication system resulted in intermittent system access.

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Conclusions

After six months of use we will conduct a more formal evaluation of the NBS. While we remain cautiously optimistic of it meeting our disease surveillance needs, we hope that over time it will evolve with more functionality. We are concerned, however, that enhancement requests will not be incorporated as quickly as we'd like.

The NBS provides a PHIN–compliant, secure transmission of data to CDC. Though we would like to use the system to satisfy all of our surveillance needs (case management, disease reporting, risk factor analysis), the need for our existing systems remains.

Existing Oregon PHIN surveillance components